IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Volker Thole	Confirmation No. 5178
Serial No. 10/526,541	Group Art Unit 1791
Filed March 3, 2005	Examiner Theodore, Magali

For METHOD FOR PRODUCTION OF FIRE-REISTANT WOOD FIBER MOLDINGS

Commissioner for Patents
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SECOND DECLARATION OF VOLKER THOLE

Sir:

1. I am the inventor of the claimed invention of USSN 10/526,541. I previously submitted a declaration in the above-identified application which was filed August 26, 2009. The previous declaration provides my qualifications as an expert in the field of the invention. I have reviewed the application and the office action of December 29, 2009.

2. My previous declaration, as well as reference literature filed in the case, demonstrate that one of ordinary skill in the art would recognize and understand what is meant by "Dry method" and "Wet method". Based on the previous office action, the undersigned provides the following comments for clarification purposes.

The invention had for its object to develop a process whereby wood fibre materials and an adhesive material based on waterglass can be intensively mixed. The homogeneous mixture should subsequently be compressible to a shaped article.

The mixing of fibre materials with adhesive materials or other binding components is altogether a demanding problem. It is well known that mixing water-containing components with wood fibre materials requires special mixing processes. Classic mixing processes (mixer resination) as known in the production of other woodbase materials (chipboard, OSB) - drum mixers, ring layer mixers - inevitably give rise to agglomerates due to the bonding effect of the water and/or of the bonding materials dissolved in the water (see: WIPO Patent Application WO/1999/014023; US 2,858,847, DD 78 881). Without disintegration of these agglomerates, the production of sufficiently firm fibre board that is free of spots of

adhesive is not possible. The references cited above are directed to technological developments which make such an agglomerate-free mixing possible, or allow agglomerates only to then redisintegrate them in a further operation (see also: http://www.woodsymposium.wsu.edu/sessions.2004/session3/Grigsby.pdf; http://www.wki.fraunhofer.de/secure/E36wb955Ps019H4nn0v37/09 Eklund-Schneider.pdf). These processes are also known as new dry-resination processes since the addition of adhesive material takes place not in classic mixers but, for example, in transportation systems with additional loosening of the fibre materials.

Agglomerate-free application is a reality in the system predominantly used in the MDF industry of adding the adhesive material in the connecting line between the refiner and the dryer. This system is known as blow line blending (see: John C. F. Walker, Primary Wood Processing, Springer 2006, ISBN-13 978-1-4020-4393-3 (e-book); Mats Sundin, Design of Blow Line Resin Injector for MDF Production, Lulea University of Technology, ISSN: 1402-1617).

Whilst during mixer resination and the new dry-resination processes, the fibre materials are dried prior to the addition of adhesive material, in the blow line process the adhesive material is added prior to fibre drying. Hence also the designations "dry resination" and ""wet resination". These terms should not be confused with the overall "wet process" and "dry process" for producing hard fibre board and MDF. Hard fibre board is produced in the wet process, since the fibres prior to hot-pressing have a moisture content of distinctly more than 20% and the fibre mat is formed from a water-fibre suspension by sedimentation. MDF is produced - regardless of the manner of adhesive addition - in the dry process, since the fibre materials prior to hot-pressing have a moisture content of less than 20% and the fibre mat is formed by scattering the dry fibres. These fundamental technological differences are long known and are used by woodbase technologists in the same way worldwide. This classification of board types is also found in standard technical reference works such as: John G. Haygreen, Jim L. Bowyer "Forest products and wood science: an introduction" Iowa State University Press, 1982; and in Maloney, T. M. 1993. Modern Particleboard and Dry-Process Fiberboard Manufacturing. isbn13: 9780879302887). Industrial standards also make a distinction between MDF and hardboard in that different standards apply to MDF (American National Standard for Medium Density Fiberboard (ANSI A208.2)) and to hardboards (American National Standard for Basic Hardboard (ANSI A135.4)). The technological differences were thus known long prior to the invention. The previously cited works (in my prior decaration) by Scheiding (1998) and Grunwald; Zerpenfeld (2005) are further examples of the state of the art at the date of the invention.

3. At the date of the invention, it was further known that waterglasses have only limited usefulness for the production of MDF. It was also a general opinion at the date of the invention that waterglasses dry out by losing water and become hard and condense by taking up CO_2. Polycondensation gives rise to molecular structures based on SiO_4 tetrahedra which, given large excesses of silicic acid, form chains and crosslinks in the commercially available waterglass solutions. The resulting equilibrium between the water content of the gel and the atmospheric humidity ends the condensation. The silicic acid which rapidly precipitates in the process is decisive for the adhesive bond. However, the silicic acid precipitation due to more rapid lowering of the pH takes place quicker in the presence of acids, and so an intensive wetting of the particle surface can be prevented on an acidic wood surface for example (Zeppenfeld and Grunwald 2005). To obtain sufficient adherence, a CO_2-free environment is accordingly necessary. Waterglasses have to be stored away from CO_2, since CO_2 leads to condensation and further to formation of silicic acid (Zeppenfeld and Grunwald 2005). On the basis of this opinion, Scheiding (1998) also comes to the following view:

"The addition of binder in the blow line similarly to MDF production is out of the question, since waterglass ideally must not come into contact with air prior to web formation, since this is enough to initiate drying and silicic acid precipitation (air CO_2) and binding power is lost."

Engler (1974) further notes that waterglasses have but little adhesive force and the adhesive bonds are always weaker than those formed by purely drying. Problems are the rapid increase in viscosity after application and the shrinking due to the high water content of the adhesive materials, and also their high alkali content (Zeppenfeld and Grunwald 2005).

However, the claimed process involves technological conditions which Scheiding; Zeppenfeld and Grunwald; and also Engler; call particularly adverse for adhesive bonding. There is contact with CO_2 in the blow line and the immediately subsequent drying, and there is a rapid increase in viscosity. These processes take place without the close fibre-to-fibre contacts important for woodbase materials as a strength-forming prerequisite. The necessary fibre-to-fibre contacts first come about in the course of the hot-pressing of the shaped fibre mats, i.e. at a time at which, according to the generally recognized state of the art prior to the invention, the waterglass should no longer have had any binding potential.

Accordingly, it was certainly not obvious to nonetheless apply the waterglass in a blow line in the production of MDF. Nor does the invention combine known processes to form a new process.

In order that sufficiently good distribution may be obtained by the addition in

the blow line, the waterglass is added as a solution. Waterglass is to be understood as meaning glassy, i.e. amorphous, water-soluble sodium and potassium silicates which have solidified from a melt. After cooling, the glass is ground and processed at more than 150°C to form a clear colloidal alkaline solution, or else to form an alkaline gel (jelly-like to solid mass). It is also customary to refer to the aqueous solutions as waterglass or liquid waterglass (LIQVOR SILICIVM).

References (included with previous declaration)

Zeppenfeld, G.; Grunwald, D.: [in German] Adhesives in the wood and furniture industry, 2nd revised and expanded edition, DRW-Verlag Weinbrenner GmbH & Co. KG, Leinfelden-Echterdingen 2005, ISBN 3-87181-359-1

Engler, R.: [in German] Soluble silicates. Seifen-Öle-Fette-Wachse, No. 7 p. 165, No. 8 p. 2007, No. 11 p. 269, No. 12 p. 298 (1974)

Scheiding, W.: [in German] Development, production and investigation of essential properties of waterglass-bound wood fibre insulating board from pine wood. Thesis at Dresden Technical University, 1998.

4. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-referenced application and any patent issuing thereon.

Date 24.06.2011 Signed V. Thole

Volker Thole